UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,451	09/19/2003	Wen-Chuan Wang	N1085-00160	7285

54657 7590 08/15/2006		

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EXAMINER
DOAN, NGHIA M

ART UNIT	PAPER NUMBER
2825	

DATE MAILED: 08/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	10/665,451	WANG ET AL.
	Examiner	Art Unit	
	Nghia M. Doan	2825	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>03</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>09/19/2003 and 0719/2006</u> .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-22</u> is/are pending in the application.

    4a) Of the above claim(s) <u>12-22</u> is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-11</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>19 September 2003</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date <u>04/12/2004</u>.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

1.   Responsive to communication application 10/665,451 filed on 09/19/2003 and

Election /Restriction responsive filed on 07/19/2006, claims 1-22 are pending.

2.   Applicant select species group I, claims 1-11 are to be examined with traverse,

the Applicant's arguments filed on 07/19/2006 have been fully considered and it

appears that Applicants have agreed with the examiner that this application contains

three patentably distinct species. Therefore, the Restriction/Election is FINAL. (see

further comments below).

3.   In the argument dated on 07/17/2006, Applicants have grouped all claims with

respect to the species exactly the same way as the Examiner's restriction requirement

dated on 06/20/2006. Although the wording is different, but the substance is the same.

The examiner will restate the restriction as suggested by Applicants as follows:

Election/Restrictions

This application contains claims directed to the following patentably distinct

species of claimed invention. The species are independent or distinct because:

I. claims 1-11 are directed to embodiment shown in Figure 1.

II. claims 12-17, are directed to embodiment shown in Figure 2.

III. claims 18-22, are directed to embodiment shown in Figure 3.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for

prosecution on the merits to which the claims shall be restricted if no generic claim is

finally held to be allowable. Currently, there have not a generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or invention to be examined even though the requirement be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention or species may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse.

Should applicant traverse on the ground that the inventions or species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions or species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C.103(a) of the other invention.

4.   Applicants are reminded to cancel the non-selected claims in the next communication.

5.   Applicant is reminded that upon the cancellation of claims to a non-elected

invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one

or more of the currently named inventors is no longer an inventor of at least one claim

remaining in the application. Any amendment of inventorship must be accompanied by

a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

6.   Claims 1-11 are to be examined in this Office Action.

Information Disclosure Statement

7.   The information disclosure statement (IDS) submitted on 04/12/2004. The

submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the

information disclosure statement is being considered by the examiner.

Specification

8.   Applicant is reminded of the proper language and format for an abstract of the
disclosure.

         The abstract should be in narrative form and generally limited to a single
paragraph on a separate sheet within the range of 50 to 150 words. It is important that
the abstract not exceed 150 words in length since the space provided for the abstract
on the computer tape used by the printer is limited. The form and legal phraseology
often used in patent claims, such as "means" and "said," should be avoided. The
abstract should describe the disclosure sufficiently to assist readers in deciding whether
there is a need for consulting the full patent text for details.

         The language should be clear and concise and should not repeat information
given in the title. It should avoid using phrases which can be implied, such as, "The
disclosure concerns," "The disclosure defined by this invention," "The disclosure
describes," etc.

9.   The abstract of the disclosure is objected to because the title should be deleted

from the Abstract page. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

10.   The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

11.   Claims 1, 6, and 8 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

As per claims 1 and 6, recite the limitation "predetermined photolithography processing condition", which is not describe in the application specification what is mean and what is condition of the photolithography processing?

As per claim 8, recites the limitation "non-OPC related errors", but the application specification does not define or list of what are errors related to Non-OPC?

12.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

13.   Claims 1, 6, and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claims 1 and 6, recite the limitation "predetermined photolithography processing condition", *which need to be clarified what is mean and what is condition of the photolithography processing.*

As per claims 1 and 6, recite the limitation *"the OPCed mask design"*. There is

insufficient antecedent basis for this limitation in the claim and it need to be clarified

what is mean to the claim invention.

As per claim 8, the claim language does not point or list out *what are errors*

related to Non-OPC.

Claim Rejections - 35 USC § 102

14.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public
> use or on sale in this country, more than one year prior to the date of application for patent in the United
> States.

15.   Claims 1-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Pierrat

et al. (hereinafter as "Pierrat") (US Patent 6,272,236).

16.   With respect to claims 1 and 6, Pierrat discloses a method and system for

inspection photomasks employs simulated image of the resist pattern *(the Abstract)*

comprising:

generating a mask picture *(mask pattern)* from a first mask, the first mask being

made from a predetermined mask design *(figure 1, element [mask 161])* with a first

OPC model *(resist behavior) (figure 5, element [330] and see it's description details)*

applied thereto *(figure 1, element [130], col. 5, ll. 8-27; figure 3, steps [210 and 220],*

col. 3, ll. 44-50);

converting the mask picture into a simulation required mask file *(taking an image from the mask and digitizing it using conventional mask inspection equipment) (figures 3, step [230], col. 7, ll. 51-54; figure 5, element 335, and see its description details)*;

conducting a first simulation under a first set of predetermined photolithography processing conditions using the simulation required mask file to generate one or more files of a first set representing a first wafer photo resist profile thereof *(figure 1, element [180], col. 5, ll. 29-44; figure 3, steps [240, 250, 260], col. 7, ll. 54-67 and col. 8, ll. 1-3; and figure 5, elements [345, 450] and see its description details)*;

applying the first OPC model to the predetermined mask design in a database mask file format *(figure 1, element [150])*;

conducting a second simulation under the first set of predetermined photolithography processing conditions using the OPCed mask design to generate one or more files of a second set representing a second wafer photo resist profile thereof *(figure 1, element [185]; figure 3, steps [255 and 265], col. 8, ll. 4-10; and figure 5, elements [315, 320] and see its description for detail)*; and

comparing the first and second sets of files *(figure 1, element [140], col. 7, ll. 8-16; figure 3, step [270], col. 8, ll. 11-17; and figure 5, element [360])*.

17.   With respect to claims 2 and 7, Pierrat discloses all the limitations of the forth set claims. Pierrat also discloses wherein the comparing includes setting one or more thresholds of the wafer photo resist profile for rejecting the first OPC model used *(col. 5, ll. 60-67 and col. 6, ll. 1-10)*;

18.   With respect to claim 3, Pierrat discloses the method of claim 1 further

comprising repeating all the steps by replacing the first OPC model with one or more

other OPC models in the second simulation to determine a preferred OPC model to be

used for generating the physical mask *(figure 1, col. 5, ll. 4-7 and figure 2, col. 6, ll. 52-*

67 and col. 7, ll. 1-41).

19.   With respect to claims 4 and 9, Pierrat discloses all the limitations of the forth set

claims. Pierrat also discloses wherein the files of the first and second sets includes two-

dimension wafer resist profile simulation files *(figures 1, 3, 5 and see their description;*

col. 5, ll. 45-60).

20.   With respect to claims 5 and 10, Pierrat discloses all the limitations of the forth

set claims. Pierrat also discloses wherein the files of the first and second sets includes

three-dimension wafer resist profile simulation files *(figures 1, 3, 5 and see their*

description; col. 5, ll. 45-60).

21.   With respect to claim 8, Pierrat discloses the system of claim 6 wherein the

comparison tool further includes means for detecting non-OPC related errors *(other*

defects) (col. 1, ll. 44-62, figure 5, element [332]).

22.   With respect to claim 11, Pierrat discloses the system of claim 6 wherein the files

of the first and second sets further includes aerial images *(col. 5, ll. 8-27).*

23.   Claims 1 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by

Garza et al. (hereinafter as "Garza") (US Patent 6,078,738).

24.   With respect to claims 1 and 6, Garza discloses a method and system for

simulating of masking process characterization *(the Abstract)* comprising:

generating a mask picture from a first mask, the first mask being made from a

predetermined mask design *(a digital representation of a patterned mask and a data*

set) with a first OPC model *(estimate of mask pattern)* applied thereto *(col. 3, ll. 28-38;*

col. 8, ll. 63-67; col. 9, ll. 1-3; and claim 1, col. 9, ll. 58-67);

converting the mask picture into a simulation required mask file *(col. 3, ll. 39-40;*

col. 9, ll. 3-6; and claim 1, col. 10, ll. 1-2);

conducting a first simulation under a first set of predetermined photolithography

processing conditions using the simulation required mask file to generate one or more

files of a first set representing a first wafer photo resist profile *(first database)* thereof

(col. 3, ll. 40-42; col. 9, ll. 6-10; and claim 1, col. 10, ll. 3-4);

applying the first OPC model to the predetermined mask design in a database

mask file format *(col. 3, ll. 42-45; col. 9, ll. 10-14; and claim 1, col. 10, ll. 5-7)*;

conducting a second simulation under the first set of predetermined

photolithography processing conditions using the OPCed mask design to generate one

or more files of a second set representing a second wafer photo resist profile *(second*

database) thereof *(col. 3, ll. 45-47; col. 9, ll. 14-21; and claim 1, col. 10, ll. 8-9)*; and

comparing the first and second sets of files *(comparing said first database and*

second database)(the Abstract; col. 3, 47-49; col. 9, ll. 24-26; claim 1, col. 10, ll. 10-12;

and including figure 7, step [218]).

Claim Rejections - 35 USC § 103

25.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

26.   Claims 2 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garza et al. (hereinafter as "Garza") (US Patent 6,078,738) in view of Pang (US Pub. 2004/0172611).

27.   Garza discloses all the limitations of the forth set of claims. Additionally, Garza also teaches that the process of simulator is modified based upon the error database to minimize the differences between a successive iteration of the aerial image and the pattern, but Garza does not implicitly teach setting one or more thresholds of the wafer photo resist profile for rejecting the first OPC model used.

Pang teaches a method of mask defect inspection impact during the transfer of a mask process of including generating a simulated wafer image have the accuracy of a resist model with the speed of an optical model by using a threshold look-up table (LUT). This threshold LUT can be created by performing a one-time simulation of a test layout with different parameter using a resist model *(Pang, paragraphs [0015-0018])*.

28.   It would have been obvious to one of ordinary skill in the art to combine Garza and Pang teachings of using optical model and the threshold look-up table to simulation the aerial image for improving accuracy of the wafer simulation results *(Pang, paragraphs [0013, and 0020])*.

Examiner Remarks

29.   Applicant is invited to review Chang et al. (US Patent 6,757,645) discloses a method of inspecting for masking process. Chang's reference is anticipated 35 USC 102 (e) rejection to reject at least the independent claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nghia M. Doan whose telephone number is 571-272-5973. The examiner can normally be reached on 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Chiang can be reached on 571-272-7483. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NMD
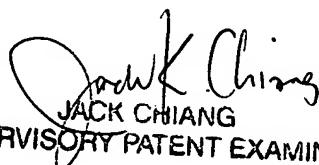
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